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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



SEPTEMBER 19, 1936

Great Cloud of Light


See Page 191

A SCIENCE SERVICE PUBLICATION

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DO YOU KNOW?

An African squash plant introduced into this country is found to be good as a table vegetable or in pies, and is resistant to the stem borer pest.

Chinese soldiers have been set to work diverting water from the Yellow River to arid land, making it useful for farming.

A summer camp for children in New York State is "pioneering" at Indian-style living, with tipis for shelter, simple diet, and Indian philosophy toward nature.

The involuntary pattern of behavior in a startled person—shoulders drawn in, elbows bent, eyes blinking, and so on—can be caught by moving pictures speeded slightly above normal.

To prevent chromium plating on automobiles from showing rust spots when at the sea shore or when roads are cleared of snow by salt or other chemicals, it has been found that waxing the metal is helpful.

Scientific study to improve grass—one of the country's most important crops—is said to be no farther advanced than corn and other cereals were 30 years ago.

Electric light cords should never be run under rugs or in door jambs, government electricians advise, because the cords will wear out quickly and may cause a short circuit.

The "rheumatism" that elderly folk used to complain of toward spring is now believed to have been mild scurvy due to lack of Vitamin C in the winter diet.

Rubber latex in a form easily applied and removed can be used to coat automobile bumpers, refrigerators, or other polished articles to protect them in shipment.

Explorers crossing the heights of Greenland's ice cap report that one problem is getting enough drinking water, because the snow does not thaw naturally in some of these polar regions.

WITH THE SCIENCES THIS WEEK

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MEDICINE

Susceptibility to Colds is Tested by Use of Oxygen

American Chemical Society Learns of Physical Tests From Which Number of Colds Can Be Predicted

WITH autumn and winter seasons for colds just around the corner, new tests reported to the American Chemical Society promise to tell you whether you are a favored risk who will have only one cold during coming months or a victim of five or a half dozen colds, one after the other, with pneumonia waiting on the sidelines.

The new arithmetical rating test on cold susceptibility, devised by Dr. Arthur Locke of Western Pennsylvania Hospital, promises to go one step farther in the control of colds.

The common cold is recognized as being one of the most costly, in terms of dollars and cents value to the individual and his employer, of all afflictions of mankind.

The new cold susceptibility test is being used to find treatments which will increase cold resistance. Tests with animals have shown that if rabbits could eliminate injected pneumonia germs from their bodies faster than the organisms can grow they will survive the drastic treatment. When the body's mechanism for removing the germs was not working at its best the speed of elimination could not keep pace with the growth and the animals died.

Similarly, a pump can keep a leaky tub dry only when its elimination rate is faster than the seepage rate.

In man, Dr. Locke indicated, the factor decreasing the danger to colds and infection from pneumococci organisms is physical fitness, as determined by the ability of the body to consume oxygen per unit of body surface.

One hundred people went through hospital tests in which they rode a stationary bicycle for about two minutes, until they were breathless but not exhausted. The contestants were given ratings on a scale of from one to zero. Only three out of a hundred gained the top rating of unity for their ability to use 1,500 cubic centimeters of oxygen per minute for each square meter of their body surface. People who consumed 900 cubic centimeters were rated six-tenths and considered in good condition.

With such arithmetical ratings before them, Dr. Locke and his associates then studied the number of colds each of the 100 individuals had in the next seven months. Sixty-four per cent of the "good condition" people rated six-tenths or better had only one cold or less, while 80 per cent of those with ratings below five-tenths had four or more colds.

The parallel animal experiments where the pneumonia organisms were injected showed comparable survival rates.

Dr. Locke and his associates did not try it on their human test subjects but in animals it was found that decreased fitness followed: maintenance in overheated quarters, morphine poisoning, toxemia and starvation where the loss in weight each day amounted to two and one-half per cent of the total body weight.

By contrast, Dr. Locke found that the following aided the rabbits to attain better physical fitness and an accompany-

ing increased resistance to the pneumonia germs:

1. Removal to cooler quarters.
2. Injections of chemical solutions such as antuitrin, cortin, sodium chloride and liver extract.

In summary the Pittsburgh cold research gives a method of rating one's cold susceptibility with an accuracy of 80 per cent and a hint, at least, into the possible methods whereby greater resistance can be achieved. In no sense can the work yet be considered a cure for the common cold, but it does offer future hopefulness that from such a line of attack a definite preventive step will be achieved.

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PHYSICS

West Coast Has New Atom Smasher Called "Rumbatron"

A NEW high efficiency radio oscillating circuit which should have equal use in television, in radiotherapy medical treatment, extremely high voltage X-rays and in experiments wherein the nuclei of atoms are shattered, has been developed at Stanford University by Dr. William Hansen. Patent rights have been assigned to the University.

The apparatus, known by members of the physics department as the "rumbatron," consists of a large copper-lined cylinder having a (Turn to page 183)



DR. HANSEN WITH THE RUMBATRON

CHEMISTRY

Experimental Plant Making Gasoline From Coal Shown

A SPECTACLE that would have thrilled the ancient alchemists who tried to make gold from lead was shown to chemists meeting in Pittsburgh during the past week.

The U. S. Bureau of Mines' new plant for making oil and gasoline from coal by the Bergius process was on display during the meeting of the American Chemical Society. It is the first and only one of its kind in the United States.

Continental European nations—lacking the vast oil resources of the United States—have many coal hydrogenation plants in operation. Germany, for example, expects to be able to produce 450,000 tons of this synthetic gasoline yearly by the end of 1936. The Bureau of Mines experimental plant, by contrast, is a small "preparedness" plant looking forward to the time when and if the United States will need to use its vast coal resources as a potential source

of oil and gasoline and their by-products.

Discoverer of the process for making coal into oil was Dr. Friedrich Bergius, the noted German chemist, who won the Nobel prize in chemistry for his work plus his equally important discovery of the way to make sugar out of wood. Both researches were outgrowths of Germany's drastic World War needs. Dr. Bergius attended the Pittsburgh meeting of the American Chemical Society and saw the hydrogenation plant.

The coal-gasoline Pittsburgh plant was constructed under the direction of Dr. Arno C. Fieldner, chief of the U. S. Bureau of Mines technologic branch.

In charge of the Pittsburgh experiment station and the hydrogenation program is Dr. H. H. Storch, physical chemist of the Mines Bureau. He explains the process as simple on paper but complex and costly in operation. Coal is powdered; mixed with some oil

previously prepared in the process to form a paste; further mixed with a catalyst to speed the reaction; pumped into a compression chamber; and hydrogen is passed through. The reaction is under high temperature and pressure.

By choice, either gasoline, heavy oil or intermediates can be obtained as the principal end product.

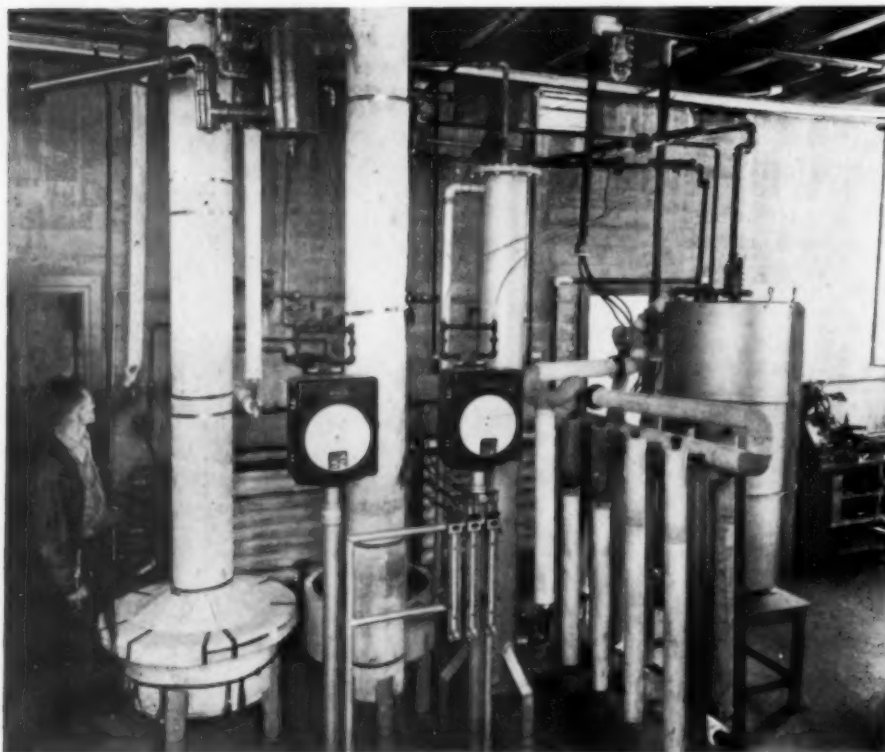
The future of the process, as has already been demonstrated abroad, is in the production of gasoline, of which the world consumes about ten times as much as it does oil. The drawback to the process in a nation like the United States—with cheap oil—is in the expense. Dr. Fieldner estimates that the cost of producing a gallon of gasoline by coal hydrogenation is about three times that of producing a gallon by refining crude oil. The initial cost of a hydrogenation plant, too, is great.

Dr. Fieldner explains that the Bureau of Mines is "looking ahead." Experts disagree on exact figures, but the Bureau of Mines points to a compromise estimate of 15 years as the life of this nation's proved oil supply—an increasing consumption balancing the greater output of gasoline from better refining and cracking processes.

The role that plentiful coal may play is explained graphically by Dr. Fieldner. The total supply of coal in the United States, if spread over Ohio's 41,000 square miles, would cover the state with a layer 76 feet deep.

The nation's present oil supply would cover Ohio with a pond only three quarters of an inch deep.

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WHERE COAL IS TURNED TO OIL

Here in the hydrogen mixing room of the Bureau of Mines' experimental plant, hydrogen atoms are added to coal dust paste to make the larger petroleum molecules.

CHEMISTRY

Food From Waste Wood is Problem of German Chemist

By **DR. FRIEDRICH BERGIUS**
As Told to Robert Potter

SO YOU want to learn how German industrial chemistry differs from the comparable American chemistry? Over here in America as I make this all too brief visit to the meeting of the American Chemical Society in Pittsburgh and then rush on to Cambridge for the Tercentenary Celebration of Harvard University, I hear much talk on the most interesting problem of finding new uses for industry in the products of agriculture; how you are turning soy beans into lacquers for your automobiles, making paper from your southern pines and trying to find uses for your great food crops. (Turn to page 191)

GENERAL SCIENCE

British Scientists Hear An Optimistic View of Future

Huxley Expresses Hope That Evolution Will Produce Great Improvement in Man's Brain; Telepathy Possible

At the meeting of the British Association for the Advancement of Science in Blackpool, England, speakers stressed the importance of the study of man. Prof. Huxley's glimpse of the future, many years distant but biologically near, was balanced by report of civilization in India some 6,000 years ago. These articles give you news from this meeting.

EVOLUTION

Brain Can Be Improved By Planned Evolution

HIGH hopes that the human brain can be greatly improved by planned evolution, even so far that telepathy and other extra-sensory activities of the mind are as commonly distributed as musical and mathematical gifts today, were expressed by Prof. Julian S. Huxley, leading British biologist and head of the London Zoological Gardens, in his presidential address before the zoology section of the British Association for the Advancement of Science.

The main part of any large change in man's biologically near future must be sought in the improvement of the brain, Prof. Huxley declared. Conscious and conceptual thought is the latest step in life's progress and in the perspective of evolution a very recent one. Prof. Huxley believes that its main effects are indubitably still to come.

"There are many obvious ways in which the brain's level of performance could be raised," he said. "If for all the main attributes of mind the average of a population could be raised to the level now attained by the best endowed tenthousandth or even thousandth, that alone would be of far-reaching evolutionary significance. Nor is there any reason to suppose that such quantitative increase could not be pushed beyond its present upper limits.

"There are other faculties, the bare existence of which is as yet scarcely established. These too might be developed until they were as commonly distributed as, say musical or mathematical gifts are today. I refer to telepathy and other extra-sensory activities

of mind, which the work of Rhine, Salter and others is now forcing into scientific recognition."

Man is not to follow the lead of the social insects, like ants and bees, in developing altruistic instincts such as they display. Prof. Huxley believes that this is impossible so long as our species continues in its present reproductive habits.

But if the dream of some biologists of "test-tube babies" were realized it might be different.

"If we were to adopt some system for using the gametes of a few highly endowed individuals, directly or from tissue-cultures, to produce all the next generation, then all kinds of new possibilities would emerge," Prof. Huxley said. "Man might develop castes, and some at least of them might be endowed with altruistic and communal impulses."

Prof. Huxley repudiated guidance of life by some external power, or the idea of a purpose in evolution. He considers "wholly false" the idea that we can trust some external power for further guidance in the future.

"Any purpose we find manifested in evolution is only an apparent purpose," he said. "It is we who have read purpose into evolution, as earlier men projected will and emotion into inorganic phenomena like storm or earthquake. If we wish to work towards a purpose for the future of man, we must formulate that purpose ourselves. Purposes in life are made, not found."

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PHYSIOLOGY

Civilization To Blame For Serious Diseases

CIVILIZATION is to blame for serious diseases which are increasingly threatening life and health, Prof. R. J. S. McDowall of Kings College, University of London, told medical scientists at the meeting.

The diseases which Prof. McDowall called "definitely diseases of civilization" are diseases of the blood circulation apart from diseases of the heart itself. Failure of the circulation, he said,

takes toll of thousands of lives each year.

In order to control these diseases, by better methods of treatment or by preventive measures, medical scientists need to know much more than they do at present about the mechanics of circulation. The purpose of blood circulation, Prof. McDowall explained, is to supply the tissues with nourishment and particularly with oxygen. Because various parts of the body differ enormously in their activity from time to time, their needs vary also.

The mechanism which supplies extra blood to a muscle during exercise is the same as that used by the body in defending itself against disease and injury. The mechanism is extremely complicated, requiring the combined efforts of heart, veins and arteries, nerves, glandular hormones and other chemicals produced in the body.

Two Supply Methods

When a muscle is used and needs more blood, it may be supplied in two ways: 1. By increased heart action which pumps blood out to the body faster. 2. By redistribution of the blood, less active and temporarily less important parts of the body being deprived of some blood which is sent as increased supply to the active muscle.

Formerly the heart was thought to be under the control of two sets of nerves, the sympathetic, which when stimulated makes the heart go faster, and the vagus, which makes the heart go slower. Now, Prof. McDowall said, there is almost complete evidence to show that the heart is really under the control of two sets of reflexes. These reflexes are responsible for speeding up the heart when the body needs more blood to resist injury or to exercise or perform work. Scientists are now working to learn exactly what sets off these reflexes.

Control of Redistribution

Redistribution of the blood from inactive to active parts of the body results from constriction and dilation of the veins and arteries through which the blood flows. Where less blood is needed the blood vessels are considered and where more is needed, they dilate. This mechanism affects the pressure of blood and when the walls of the blood vessels lose their elasticity and so cannot contract and dilate readily, serious disease may result. The dilation of the blood vessels is brought about by both chemical and nervous means. Of the chemical means, in Prof. McDowall's opinion, the most important is change in acidity.

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PSYCHOLOGY-PHYSIOLOGY

**Moderate Drinking
Makes Driving Hazard**

MODERATE amounts of alcohol consumed as whiskey or beer cause autoists to drive faster and make more driving errors, Dr. H. M. Vernon, of the Industrial Health Research Board, reported to the British Association.

"Some drivers maintain that moderate quantities of alcohol have no effect or improve their driving," Dr. Vernon explained.

Then he told of tests on fifteen experienced autoists and five non-drivers who bravely subjected themselves to "experimental doses" of whiskey or beer taken on an empty stomach. An ounce of whiskey was administered, rather more than an Englishman gets when he orders a "large whiskey." The beer dose contained only a sixth of an ounce of alcohol.

The human guinea pigs were not allowed to drive on real roads in the interest of safety and scientific accuracy. Instead they were put at the wheel of a dummy car and directed to drive it along a track projected as a moving picture on a screen. The path taken by the car was automatically recorded.

The mild beer had no effect on experienced drivers, but it affected the five non-drivers more than the whiskey. For the experienced drivers the whiskey caused an increase of six per cent in driving time and an increase of twelve per cent in driving errors. The effect of alcohol differed greatly among the persons tested, but half of them speeded up ten to twenty-four per cent.

"As a rule the drivers were quite unconscious of any speeding up after drinking alcohol," Dr. Vernon concluded, "and this suggests that even moderate quantities of alcohol should be avoided before driving."

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ARCHAEOLOGY

**Finds Traces of Ancient
Civilization in India**

A DISCOVERY that is expected to push back the age of known human habitation in India and throw much light on its culture was reported by Mlle. Simone Corbiau, Belgian archaeologist who conducted an exploration for the Brussels Museum.

Digging at a site that was supposed to contain only remains of the Greco-Buddhist times, Mlle. Corbiau found evi-

dence of a far more ancient civilization. The age of the archaic pieces she discovered is believed to be about 4000-3500 B.C., some 6,000 years ago.

The region in which Mlle. Corbiau made trial diggings is the Peshawar district in the uppermost corner of the Northwest Frontier Province of India.

Mlle. Corbiau believes that a very early stage of Indus Valley civilization has been discovered, which is paralleled by finds in Sumerian Mesopotamia of the Jemdet Nasr period, protohistoric Aegean, and at the prehistoric site of Anan in Russian Turkestan.

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SOCIAL SCIENCE

**Urges More Vigor In
Studying Science of Man**

MAKING a plea for the application of research to the "science of man" with a vigor equal to that used in the recent exploration of the physical world, from atom to universe, Sir Josiah Stamp, the British economist, delivering the presidential address at the meeting of the British Association for the Advancement of Science, declared that the shortcomings of the active world are to him "but the fallings short of science."

"Wherever we look we discover that if we are to avoid trouble we must take trouble—scientific trouble," Sir Josiah said. "The duality which puts science and man's other activity in contrasted categories with disharmony to be resolved, gaps to be bridged, is unreal. We are simply beholding ever-expanding science too rough round the edges as it grows."

An attack along the social sciences front from politics and education to genetics and human heredity is long overdue in Sir Josiah's opinion. Expenditure on the natural sciences is some eight to ten times greater than that on the social sciences. As an example, hardly any money at all is available for research into the immense and vital problems of population in all its qualitative and quantitative bearings.

"In some ways we are so obsessed with the delight and advantage of discovery of new things that we have no proportionate regard for the problems of arrangement and absorption of the things discovered," he remarked. "We are like a contractor who has too many men bringing materials on to the site, and not enough men to erect the buildings with them. In other words, if a wise central direction were properly allocating research workers to the greatest marginal advantage, it would make some

important transfers. There is not too much being devoted to research in physics and chemistry, as modifying industry, but there is too much relatively to the research upon the things they affect, in physiology, psychology, economics, sociology. We have not begun to secure an optimum balance. Additional financial resources should be applied more to the biological and human sciences than to the applied physical sciences, or possibly, if resources are limited, a transfer ought to be made from one to the other."

Sir Josiah deplored the common notion that economics should be judged by its ability to forecast, especially to a particular date. This idea is fallacious because the prophecy if "true" and believed must destroy itself. People will act to anticipate the date and thus destroy the prediction.

The changes brought about by the impact of science upon everyday economic life were classified by Sir Josiah as "work creators" and "work savers." One tends to offset the other. Dislocations caused by labor-saving machinery can most easily be made good by a due balance of new labor-creating commodities.

Because increase of population has slowed down in recent years, slackening the increase in demand for commodities, he suggested that "perhaps birth control for people demands ultimately birth control for their impedimenta."

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LANGUAGE

**System of Signs Ideal
International Language**

A SYSTEM of making signs was recommended by Sir Richard Paget as the ideal international language, that would be natural to all races as well as easy to learn and remember.

His study of sign language and his conclusion that speech is simply mouth gestures expressing meaning gave rise to Sir Richard's suggestion.

The proposed world sign language would be controlled from the start, he suggested, by a world commission that would promulgate its decisions by means of movies and television.

"Man is not primarily a tool-using animal," Sir Richard said. "He is rather a symbol-using animal."

"Speech was born when separate signs were evolved for separate ideas. The corresponding mouth gestures were combined with the emotional language of grunts, chuckles and cries, and ultimately produced speech."

"Sign language could be logically developed so as to express the highest and subtlest thoughts of man.

"Auditory speech superseded sign language because it required less effort. It left man's hands free, and did not

need light or direct vision for its understanding.

"The development of speech is retarded by pedantry, from which sign language is at present free."

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ARCHAEOLOGY

Cyclops Was Not Greek; The Babylonians Knew Him

Discovery of a Bas Relief Showing a Babylonian God Stabbing a Cyclopean Demon Dates Him As Of 2,000 B. C.

REMEMBER old villain Cyclops in Greek mythology, with one terrible eye in the middle of his forehead?

That picturesque monster, American archaeologists have now discovered, was not invented by Greek imagination at all. Babylonians knew about Cyclops—which means round-eyed—back in the days of Abraham. And that was around 2000 B.C., and over a thousand years before the Greek poet Homer made the Cyclopes famous as giant cave dwellers who ate men and defied gods.

Discovery of a bas relief plainly showing a Babylonian god stabbing one of the Cyclopean demons has been reported from Iraq, where an expedition of the Oriental Institute of the University of Chicago has been unearthing Babylonian cities. The remarkable sculpture was unearthed at Tell-Asmar, site of ancient Eshnunna.

The Cyclops is shown completely in the god's power. His hands are tied behind his back, a broad knife is stuck in his ribs, and just to be sure he doesn't get away the god has planted one foot on old Cyclop's toes. In all this discomfort, the sculptor has forced Cyclops to "turn his face to the audience" to reveal the horror of his one big round eye and the sightless traces of ordinary eyes below it. Rays of light or fire around his head like flower petals show that this was indeed no ordinary creature.

Fashion a Clue

Dr. Henri Frankfort, field director of the Iraq expedition, calls attention to the flounced skirt in which the monster was dressed, as a significant historic point. Clothes like this were fashionable in Mesopotamia before 2500 B.C. But by 2000 B.C., when the sculpture was made, flounced skirts were antiques, and the sculptor, trying to dress Cyclops in traditional manner, managed only what

Dr. Frankfort calls a "bungled version." From this bit of evidence, Dr. Frankfort is convinced that Cyclops was no new idea to Babylonians even as early as 2000 B.C.

Finding that Greeks borrowed mythological figures from the East, Dr. Frankfort emphasizes, "does not diminish in any way our appreciation for the originality of the Greek mind."

The Greeks were late arrivals in an ancient and highly developed civilized world, the archaeologist points out, and discoveries such as this illustrate how our modern civilization is, through Greece, inseparably linked with the ancient Near East.

Snake Worshipers

First evidence Babylonians were snake worshipers is another result of the expedition. The discovery consists of two cauldron-shaped pots one placed upside down over the other, unearthed in a temple at Tell-Asmar. Decorations on the jars glorify the power of the snake, and an unbroken saucer found in the lower jar with small animal and bird bones suggests to the archaeologists that a live snake was kept in the covered container.

At Ischali, another site explored by the expedition, a temple of sun-dried brick has come to light, revealing that ancient Babylonian architects built temples on a large scale and worked with great care. A statue of the goddess Ish-tar-Kititum was found still enthroned in the temple.

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A little 3-inch head on a bas-relief in the Boston Museum of Fine Arts is believed to be a portrait of the poet Horace, whose features have heretofore been missing among the hundreds of statues of Romans known today.



RUDE TO CYCLOPS

The Babylonian god who thus stabs the one-eyed demon, pulls his beard, and treads on his corns, incidentally proves to scientists that Cyclops was known at least a thousand years before Homer wrote of him.

From Page 179

filament and a grid like some giant radio tube. Radio waves bounce from end to end of the cylinder.

The high energy waves produced may be used directly inside the tank or, enlarged many times, for radiotherapy. Or they can be carried off on a wire to the antenna of a television broadcaster.

The waves also may be used to speed up electrons passing through the chamber, Dr. D. L. Webster, chairman of the physics department, pointed out. Such electrons would have energies equal to or above 5,000,000 volts. Directing the electrons on a target would create penetrating X-rays; or by shooting them at atoms nuclear disintegrations could be studied.

Distinguished From Cyclotron

The present name rumbatron was chosen to distinguish the device from the cyclotron apparatus of Prof. E. O. Lawrence at the University of California.

An important difference between the new rumbatron and the cyclotron is that the former uses electrons as the bombarding particles while the cyclotron employs atomic nuclei themselves, which are much heavier.

Small models of the rumbatron have been successfully operated showing that the design is satisfactory for the large apparatus now being built.

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CHEMISTRY

Obtain Pure Extract of South American Drug

AMERICAN chemists have isolated in crystalline form the potent material which South American natives have long used in the rough state to combat a wide range of diseases.

This important finding of a powerful protein-cleaving enzyme which dissolves parasitic worms was announced at the sessions of the American Chemical Society by Dr. Alphonse Walti, research chemist of Merck and Co., Rahway, N. J.

The enzyme, obtained as an extract from the milky sap of the fig tree and therefore named ficin, is found to dissolve live worms in the laboratory. Ficin has been identified as the active principle of Oje, the mysterious healing agent widely used by South American natives.

"The natives regard Oje as a specific for tuberculosis, anemia, chronic stomach troubles and as a cure for ulcerous sores," said Dr. Walti.

In 1934, Dr. Walti continued, Profs. B. H. Robbins and P. D. Lamson of Vanderbilt University showed that the milk, or latex, of the fig tree contained a similar protein-cleaving enzyme. In 1929 Dr. Fred C. Caldwell of the Rockefeller Foundation proved the efficacy of the fig tree latex against whipworm.

The experiments, wherein worms were dissolved by the crystalline enzyme, upset previously-held theories on enzyme reactions, Dr. Walti pointed out. "It has previously been maintained," he said, "that enzymes are without effect on living cells or organisms. The dissolving of live ascaris by crystalline ficin renders this common conception invalid."

Science News Letter, September 19, 1936

CHEMISTRY

Ounce of Oil Covers Eight Acres of Surface

HOW FILMS of oils can spread so thin that one ounce of oil can cover up to eight and nine acres of water surface was described at the meeting of the American Chemical Society by Prof. William D. Harkins and Dr. R. J. Myers of the University of Chicago.

Such thin films which are often only one molecule thick—about one twenty-millionth of an inch—have important uses in the lubrication of automobiles, the making of paint, the manufacture of laminated "safety glass" for windows, in

color printing and in biology and medicine.

A new finding of scientists, said Prof. Harkins, is that such thin films can also exist in a layer several molecules thick. Science has as yet no adequate theory to explain the characteristics of such films.

The behavior of the films is, indeed, strange. With new apparatus the University of Chicago chemists are now learning that the films can be in a "tight" condition wherein the molecules stand on end and side by side like the riders of a rush-hour subway car. Or they can also be in an "expanded" state where they seem to lie over more and take up more room.

Other types of oil molecules like to lie flat on the surface and thus cover more area. They too have the "tight" or "expanded" pattern.

An ounce of oil with the upright films will cover three and one-half acres of water surface, said Dr. Harkins. The expanded films will occupy eight acres of water surface. And if the "lying-down" molecules are considered they will be found to cover from fifteen to twenty acres of surface.

Science News Letter, September 19, 1936

PHYSIOLOGY

Spinach Loses Favor After Chemical Research

SPINACH, long held to be a needed factor in the diet of growing children, took a scientific setback at the meeting of the American Chemical Society. The trouble with spinach, it appears, is that it contains oxalic acid.

In studies reported by scientists of the Children's Fund of Michigan the calcium retention of one little 5-year-old girl was .176 grams a day. When spinach was added to her diet the retention fell to .122 grams a day. In a test period when oxalic acid was added to her diet the calcium retention decreased to .082 grams a day.

Oxalic acid, it appears from the report, combines with calcium in the diet and turns it into a form which the human body cannot use. The relatively high oxalic content of spinach appears to be the cause of the vegetable's action.

Calcium is needed by the growing child for the formation of bones and the teeth.

The Children's Fund scientists included: Priscilla Bonner, Frances C. Hummel, Mary F. Bates, James Horton, Helen A. Hunscher, Marsh Poole, and Icie G. Macy.

Science News Letter, September 19, 1936

IN SCIENCE

MEDICINE

Cancer Explained As Uncontrolled Cell Growth

CANCER was explained to the University of Wisconsin's Cancer Institute as "the uncontrolled multiplication of permanently altered body cells which no longer need the special environment or special agent which originally induced them to grow."

Dr. Warren H. Lewis, Carnegie Institution embryologist of Baltimore, Md., said that this finding is the result of research during which rat and mouse tumor cells were kept growing several years. The agent that induces normally behaving cells to "go wild" or become malignant may be a virus, a hormone or a chemical substance, Dr. Lewis said. The cancerous cells grow true to their own particular type and where they grow the normal cells soon disappear.

Thyroid gland added to the diet speeds and increases the growth of mouse tumors induced by coal tar irritation, Dr. Leiv Kreyberg, Norwegian scientist, told the institute. He has been testing theories as to cancer growth by animal experimentation. Fresh liver also increases rate of growth but does not influence the time of onset. Magnesium salts have no influence. Discouraging is his conclusion that well nourished animals have more vigorous cancer growths.

Heredity plays a large part in cancer, Dr. Madge Thurlow Macklin of the University of Western Ontario told the institute.

Science News Letter, September 19, 1936

ENGINEERING

State of Washington Leads in Water Resources

THE STATE of Washington leads the United States in potential water-power resources with 8,768,000 horsepower available 90 per cent of the time, according to a new estimate just announced by the U. S. Geological Survey. Next comes California with 4,605,000 and Oregon with 4,361,000 horsepower. These three states possess more than 40 per cent of the total for the United States.

Science News Letter, September 19, 1936

WOOD FIELDS

ENGINEERING

Prefabricated Houses Now Made With Glued Wood

By G. W. TRAYER, Chief, Division of Forest Products, U.S. Forest Service

GLUED WOOD construction is the basis of the Forest Products Laboratory's new system of prefabricated all-wood house construction.

Erection of the first demonstration house was accomplished by seven men in three working days. This one-story 4-room and bath house, complete in every particular, was put on exhibit last year. This spring the further development of two-story construction, with attractive modifications in architectural treatment, was put on display.

This style of prefabricated house is not being manufactured commercially. All I can say at this stage is that its economy and structural merit have created keen interest among builders and housing authorities, sufficient to put extra steam into our work to perfect its details.

The unit panels of which the house is built represent a principle of airplane design brought down to earth, namely, the stressed-covering principle. By making a covering integral with its framework, the full strength of the covering is utilized, and the framework can be made lighter. That is where the glued wood construction comes in.

In our studies of the housing problem, it occurred to us that gluing was an ideal way to secure this integration in the panels we needed. It worked. Floor panels of glued plywood were constructed in which the joists were four inches narrower from top to bottom than the usual size, yet a loading of 300 pounds per square foot was carried equally well. Similar gains in strength and lightness were made in wall panels.

The next step was to standardize panel sizes and to devise means of fitting them together quickly and efficiently. When this was done, our first demonstration house was built, showing that wood can be shaped into units capable of speedy assembly into a comfortable modern dwelling.

Glued wood construction is pressing forward on many fronts. Plywood and

veneers are an important example, already in use on a tremendous scale. Plywood consists of several sheets of veneer glued up with the grain of the sheets or plies running crosswise to one another, so that all tendency of the wood to split is ironed out, and shrinkage is minimized.

Modern glues are a wonderful substitute for nature's joinery; our tests show that beams, columns, and arches made up of small pieces glued along faces and edges are as strong as solid wood.

Science News Letter, September 19, 1936

PHYSICS

Measure Cosmic Rays At Record Altitude

SOARING to a record height of 92,000 feet (17½ miles), a tandem of five balloons carried a sensitive self-recording electroscop to a new altitude record for cosmic ray research, Dr. Robert A. Millikan, California Institute of Technology head, revealed.

The instrument, one of five released early in July at San Antonio, and one of four recovered, obtained a perfect film record of cosmic activity at the extremely high level.

The record is the first obtained by an electroscop that shows that ionization in the upper air reaches a definite maximum and returns rapidly to lower values as still higher altitudes are reached.

The 92,000-foot mark, 2,000 feet higher than ever before attained by pilot balloons, was 98.3 per cent of the way to the top of the atmosphere.

Each electroscop, released by Dr. Millikan, Dr. H. Victor Neher, and Dr. S. K. Haynes, was carried aloft by five balloons, and a reward of \$6 was offered for the return of each instrument.

The instruments, rising to an altitude varying from 55,000 to 92,000 feet, were found between 30 and 100 miles from San Antonio. The balloons were aloft about three hours.

Three of the same electroscopes, together with five new ones, are en route to Madras, India, where Dr. Neher will make similar stratosphere explorations.

Regarding the significance of the evidence that cosmic ray ionization reached a maximum and started the other way, Dr. Millikan said it indicated that incoming rays are not in equilibrium with their secondaries.

Drs. Neher and Haynes developed the new electroscopes used. Dr. Millikan hailed their perfection as "a really notable feat."

Science News Letter, September 19, 1936

MEDICINE

Germs May Give Cancer Fighters a Cure

DISEASE germs may provide a cure for rapidly-growing cancers. Steps in the development of this important and promising weapon against certain types of cancer—for it will probably not be a cure for all cancers—were reported by Dr. H. B. Andervont of the U. S. Public Health Service at the University of Wisconsin's Cancer Institute. Although still in the experimental stage as Dr. Andervont reported it, the results of the animal studies are promising enough to suggest the possibility of clinical trials being made soon.

The growth of mouse cancers has been checked and the tumors have hemorrhaged and died when preparations of disease germs were injected into or spread on the cancers. Almost any kind of disease germ or bacteria will do, it seems. Among those used in the experiments have been the colon bacillus and the germ that causes meningitis. The cultures of bacteria are killed by heat, filtered and treated chemically to remove all traces of substances that would be poisonous to the animal body, without removing the substance that destroys the tumor.

The material finally obtained and injected into the mouse tumors is called a bacterial filtrate. It apparently contains a substance which destroys the newly-formed blood vessels of rapidly-growing tumors, thus cutting off the nourishment for the tumor cells, whereupon they die as seen by the recession of the tumor. Efforts are now being made to isolate from the bacterial filtrate the substance that has this effect on the blood vessels. Not all types of animal tumors have yielded to this bacterial treatment. The spontaneous breast tumors of mice, for example, are not affected by it. Some of the tumors induced by chemicals are affected by this treatment.

Using bacteria to fight cancer is a new-old method of attack. The idea goes back some forty years, originating when it was observed that development of an infectious or germ-caused disease occasionally checked the growth of a cancer from which the patient had previously suffered. Attempts to apply this observation were made but were unsuccessful and the idea was more or less abandoned. Only within the last few years have intensive efforts been made to develop a cancer weapon along this line of approach.

Science News Letter, September 19, 1936

GENERAL SCIENCE

Harvard Conference Hears Scientists From Many Fields

How Embryonic Development is Determined, Cause of Hayfever, Nature of Cosmic Rays Are Some of Topics

Rarely is it possible to listen to such an assemblage of notable men of science as recently gathered at Cambridge, Mass. See SNL, Sept. 12, for the first installment of highlights of this conference.

EMBRYOLOGY

Prof. Hans Spemann—Chemical Organizer

CHEMICAL commanders in the bodies of embryo animals, giving orders that are received and obeyed by the developing parts, were described by Prof. Hans Spemann of the University of Freiburg, Nobel prizewinner.

The mode of action of these commanders is known, and the places where they can be found during bodily development; but their exact identity remains a secret. Nobody has ever got one out, whole and separate, and made a complete chemical analysis of it—Prof. Spemann is still digging at that part of the problem.

When embryonic development begins, with the fertilized egg cell, there forms first a hollow globe of cells, with a tiny opening at one side, the blastopore. At this stage therefore there is neither head nor tail to the animal, nor much of anything to suggest where these regions and the other organs will eventually be.

But Prof. Spemann found that if he took a bit of the lip of the blastopore from one of these early-stage embryos, and transplanted it onto another embryo at the same stage, this transplanted bit determined a head-to-tail body axis. Since the second embryo already had its own blastopore, there were two axes, and a double embryo developed.

Prof. Spemann gave the name "organizer" to the unknown substance or influence emanating from these tiny tissue transplants. He found that there were other critical points of growth, in later development, that possessed organizers of their own, influencing the whole embryo, or limiting their effects to particular regions or organs as they formed. He was able to produce organ-

izer reactions without transplanted tissues, using only extracts from various kinds of animal material or even chemically pure organic compounds. There is competition or interplay between these various regional organizers, and this determines development.

The obedience of the developing animal parts to the organizers' orders is not blind and slavish. The growing organs have something to say on their own behalf. Thus, if a bit of skin is transplanted to where the brain is to form, the skin-tissue will change its nature and form brain-stuff; but it will be the brain of the kind of animal it came from, not of the animal species into which it was planted. Similarly, if the side of a toad embryo head is planted onto the head of a newt embryo, it will grow fast in its new place, but will produce jaws and other head parts of the toad type, not those of a newt. That is to say, whatever command is issued by the inductors of the host, the response is executed by the transplanted tissue in the manner provided by the inheritance of its own species.

Science News Letter, September 19, 1936

PHYSIOLOGY

Sir Joseph Barcroft—Why We Breathe

TAPPING an embryonic sheep on its snout with a glass rod furnished a group of scientists with an explanation of the rhythm of breathing. The experiments and the way in which they explain the fundamental nature of this breathing rhythm were described by Sir Joseph Barcroft, Cambridge University professor of physiology, at the Harvard Tercentenary celebration.

Scientists have considered three different explanations for the rhythmic in-and-out of air which they call respiration but which is breathing to most of us. According to one explanation, breathing in starts a message to the brain which checks the inhaling phase and starts the exhaling phase of breathing. This exhaling, in turn, sends a message to the

brain that checks the exhaling and starts the inhaling phase.

According to another explanation, there is a continual urge in the central nervous system, which includes the brain, to breath in, but the act of inspiring sets up sensory impulses which check the effort. The lung then passively returns to its unexpanded condition, which takes care of the exhaling. According to this explanation, the brain and central nervous system is the essential seat of breathing and does not merely act as a telephone exchange.

Central Nervous System

The third view is that breathing is due to rhythmic activity of the central nervous system. The sheep embryo experiments, undertaken with another purpose, unexpectedly furnished support for this view, Sir Joseph said. Sir Joseph and his associates were seeking the solution to another scientific problem, that of how the first movements of the unborn young of mammals start. Do the ordinary movements of legs and arms and other parts of the body arise from generalized mass movements of the whole body, or do the localized movements develop into generalized motions all over the body? Sir Joseph and associates sought the answer by studying the large and slowly growing embryo of the sheep. They found that the mass movement is built up from localized movements and when built up can be resolved into localized movements which have definite significance and purpose.

A stimulus such as tapping the sheep's snout with a fine glass rod starts a localized movement of the snout and head. Later this stimulus sets up rhythmic movements through the whole body, mass movements which start with the local stimulus to the snout. At a still later stage, these rhythmical mass movements break down and more localized ones appear in response to the stimulus, such as straightening and stretching of tail and limbs. At first these stretching movements are spasmodic, later they become rhythmic. At a still later stage, the lamb fetus is so lively that the rhythmic movements are practically constant and the fetus looks like an ordinary animal breathing naturally. A stimulus at this stage produces more energetic rhythmic movements that give the appearance of an animal out of breath as the result of effort.

The inference is that these rhythmic body movements, which may be elicited by a stimulus to the sensory nerves, show a rhythmic activity of the nervous system which would account for the

rhythm of breathing as well as for rhythm in other body activities.

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PHYSIOLOGY

Dr. Karl Landsteiner—Antibodies and Sneezes

THE SNEEZES of the hayfever sufferer, the hives of the person who is upset by eating fish, the rash or more severe reaction that follows taking a drug in persons hypersensitive to it, are all signs of a "very comprehensive and remarkable biologic phenomenon," Dr. Karl Landsteiner of the Rockefeller Institute for Medical Research told fellow scientists at the Harvard Tercentenary celebration.

Best known for his discovery of the blood groups, Dr. Landsteiner has investigated other features of blood, such as its mysterious antibodies which fight invading disease germs. From that he has branched over into a study of the body mechanisms for resisting other foreign substances, particularly chemicals taken into the body as drugs.

The antibodies, Dr. Landsteiner believes, play a defensive role not only against disease germs but in allergies, such as hayfever, and in drug idiosyncrasies, although scientists have not yet been able to demonstrate their presence in all cases of these conditions.

By means of these antibodies, circulating in the blood or fixed in body tissues, the body adapts itself to various chemical agents.

"If successful, this mechanism guards against infectious disease," Dr. Landsteiner said, "but when it miscarries it induces sensitivity to exceedingly small quantities of proteins or simple chemical compounds."

Science News Letter, September 19, 1936

CHEMISTRY

Prof. August Krogh—Isotopes a Tool

CHEMICAL isotopes, the seldom-met "twins" of ordinary atoms, are being used in Denmark to trace the course of water, minerals, and organic substances through the physiological processes of plant and animal bodies. Some of the results were revealed for the first time, by Prof. August Krogh of the University of Copenhagen, speaking before the Harvard Tercentenary Conference.

An isotope might be defined as a form of a chemical element that behaves chemically like its better known twin,

but is different enough on the physical side to permit it to be detected by suitable physical means. Thus, it is possible to produce a form of phosphorus distinguished by being radioactive, whereas ordinary phosphorus is not. Or, the famous heavy hydrogen is twice as heavy as ordinary hydrogen, so that heavy water containing it can be detected by weighing it.

Prof. Krogh and his associates have been giving isotopes of various nutrient elements to plants and animals, and afterwards analyzing the tissues from various parts, to find out where the isotopes went. They found, among other things, that radioactive phosphorus traveled around plants a good deal more rapidly than had previously been thought to be the case. Also, radioactive phosphorus turned up in the dentine of teeth, which has always been thought to be pretty well cut off from the rest of the body.

Another series of experiments, using heavy water, showed that water gets around through the body of an animal quite rapidly, once it enters, and that any given quantity of water comes to be distributed pretty evenly throughout the whole body. Water-dwelling animal forms were shown to be capable of absorbing water through their gills, and also through their skins when these were not too thick.

Prof. Krogh stated his belief that of all types of isotopes, the radioactive ones would prove most useful in physiological studies because it is so easy to detect them. He said that powerful apparatus is now being erected in his laboratory for the preparation of new kinds of radioactive elements.

Science News Letter, September 19, 1936

CHEMISTRY

Prof. The Svedberg—The Protein Molecule

FROM another Baltic country came a report on investigations into the size and makeup of the protein molecule, among the largest and most complex of atomic aggregates. Prof. The Svedberg of the University of Upsala, Sweden, told of methods and instruments evolved in his laboratory, which include an ultra-centrifuge that can whirl solutions at a rate of from sixty to seventy thousand revolutions a minute. This separates out intimately mixed things, as cream is separated from milk in a cream separator, and permits physical and chemical examinations to be made of the parts.

Prof. Svedberg's results confirm the idea previously held, that protein molecules are relatively enormous, containing tens or even hundreds of thousands of atoms each, as against a mere half-dozen or dozen in common inorganic compounds, or a few scores or hundreds in the simpler organic molecules. Also, it was found that these huge molecules were not built up single atom by atom, but that whole blocks of atoms were manipulated at a time. That is, they were not put together a brick at a time, like a mason erecting a wall, but more like bolting together the whole sides of a knock-down house.

Science News Letter, September 19, 1936

MEDICINE

Dr. Kiyoshi Shiga—Dysentery Unconquered

BACILLARY dysentery, one of the great health hazards of tropical regions, which occasionally reaches into more northern parts, is still unconquered, scientists at Harvard's Tercentenary were told by Dr. Kiyoshi Shiga of the Kitasato Institute, Tokyo.

Dr. Shiga more than thirty years ago discovered the bacillus or germ that causes dysentery. Now he told with keen regret how, in spite of this discovery and a lifetime of subsequent research, the disease still defies the efforts of himself and other scientists to wipe it out.

In the years that passed since the epochal discovery of Dr. Shiga's youth, much new knowledge has been gained about the disease, he related. Almost a hundred different strains of germs that cause the disease have been discovered. The poison produced by the germ has been studied and found to rank next to the toxins of tetanus (lockjaw) and diphtheria in strength. An antitoxin has been prepared and found effective in mild and medium cases, but less effective in severe cases.

Carriers of the bacillus present an important problem, as they do in typhoid fever. Carriers of one type of dysentery bacillus have decreased, but carriers of another type have increased. The decrease Dr. Shiga attributes to the fact that another bacillus normally present in the intestinal tract has been able to overcome the Shiga type of dysentery bacillus, but has become accustomed to living side by side with the other type which consequently still flourishes.

"Suppression of carriers may be an important problem but suppression of the cases is more feasible," Dr. Shiga

declared. He recommends immunizing or raising the resistance of the general population, in countries where dysentery is a problem, by vaccination.

Here again, the scientists are checked in their efforts to wipe out the disease. A vaccine has been prepared against dysentery, and has been given by mouth to hundreds of thousands of people in Japan during the last ten years. Though the results are claimed to be favorable according to the statistics, Dr. Shiga said that "a careful consideration" is still needed before accepting this method of vaccination.

Science News Letter, September 19, 1936

PHYSICS

Prof. Arthur H. Compton— Electric Not Light

COSMIC RAYS are made up of electrical particles (electrons and possibly protons) and not of light particles (photons), Prof. Arthur H. Compton, University of Chicago Nobelists, told the Harvard Tercentenary Conference. He presented a carefully marshalled array of fact and argument in support of his thesis.

Physicists agree quite generally that electrical particles are actually detected at the earth's surface with specially constructed instruments. But it is also generally agreed that most of these particles are secondaries, that is, they have been kicked into activity by the impact of a primary source of energy arriving at great speed from outer space very much as a marble or a billiard ball is knocked spinning by the impact of the "taw" or the cue ball.

The disputed question has been whether the primary cosmic rays are light particles or electrical particles.

In support of his claim that primaries as well as secondaries are electrical particles, Prof. Compton cited the obedience of the cosmic rays to the pull of the earth's magnetic field. Electrical particles can be attracted by magnetism. Light particles can not. Again at great depths under earth and water, the cosmic rays lose energy and are absorbed in a manner characteristic of electrical particles rather than photons.

A few instrumental results have shown undoubted light effects. The supporters of the light particle theory have claimed these were due to photons from outer space that got clear through to earth without colliding with any particles and turning them into secondaries. Prof. Compton in rebuttal suggested that these light bursts were themselves

secondaries given off by electrical particles rather than the other way around.

Science News Letter, September 19, 1936

ARCHAEOLOGY

Prof. Eduard Norden— Roman Crop Insurance

CROP insurance, now much to the fore as a politico-economic topic, interested farmers in the very earliest Roman days, too. It took the form of prayer for freedom from plant pestilences and other destruction in the fields—somewhat reminiscent of modern prayers for rain and against grasshoppers.

The earliest of these prayers, which is also the oldest known Latin hymn, was described in a new translation by Prof. Eduard Norden of the University of Berlin. It was chanted at field-edges by the Arval Brethren, a sort of pagan religious order, whose special job it was to pray for the welfare of the crops.

The hymn is addressed to Mars—who was oddly enough the god of agriculture as well as of war. It is not in the stately classic Latin of Cicero and Vergil, but in a rude early language very difficult to translate at all. In addition to its endeavor to placate "wild Mars," it also calls upon the lesser local divinities, the Lares and the Semones, and ends in a five-fold alleluja chorus of "Triumph! Triumph! Triumph! Triumph! Triumph!"

Science News Letter, September 19, 1936

GENETICS

Prof. Filippo Silvestri Polyembryony

QUINTUPLETS are nothing to get excited about in the insect world. To some species of small winged creatures, indeed, a mere five offspring at a time would seem rather close to outright race suicide.

The strange biology of multiple birth among insects was discussed before the Harvard Tercentenary Conference by Prof. Filippo Silvestri of the Royal College of Agriculture, Portici, Italy.

In this mode of "super-quintupling," most familiar to scientists in certain parasitic members of the wasp family, the number of individuals eventually resulting from the hatching of a single egg ranges from ten or fifteen to hundreds and even thousands, depending on the species concerned. Scientists call the phenomenon polyembryony, or the condition of many embryos.

When the insect's egg begins to

divide, it first forms a mass of cells, such as constitutes an early stage in the development of any individual. But this cell mass does not proceed to organize and differentiate into the various body parts, in the ordinary fashion. Instead, it breaks apart into separate cells, or small groups of cells; these re-multiply into considerable cell-clumps, and then proceed to turn into larvae, which eventually change into the fully developed insects.

What causes this breaking apart of the original cell mass is still a point of dispute among biologists. Prof. Silvestri is inclined to the opinion that since these insects are all parasites, developing from eggs laid in the eggs of larger insects by their mothers, the presence of abundant fluid, rich in nourishment, may make the first cells more independent of each other than are the cells in comparable early stages of development in other animal forms.

Certainly polyembryony is an advantage to the species that practice it. It results in more rapid multiplication, and hence increases the chances of survival and spread for the species, in a world where its peculiarly selective habits of egg-laying impose pretty heavy handicaps.

To man, also, the process offers certain benefits. The insects described by Prof. Silvestri belong to the large class of tiny, gnat-size wasps that lay their eggs in the eggs of other insects, particularly caterpillars. Their larvae feed on the tissues of these involuntary hosts, eventually killing them and cutting short their careers of crop destruction. When a single egg releases from a dozen to a thousand of these tiny borers from within, the caterpillar's career is so much the shorter, and its possibilities of harm correspondingly the less.

Science News Letter, September 19, 1936

GEOLOGY

Prof. Arthur Holmes— Billions of Summers

GEOLOGICAL evidence that for nearly 2,000,000,000 years there have been no astronomically significant changes in the heat and dynamical relations between the earth and sun was presented by Prof. Arthur Holmes. Layers of clay laid down in the earliest known sediments so closely resemble the layers of the most recent deposits that Prof. Holmes is convinced that they were formed under seasonal variations as marked as those of today.

Science News Letter, September 19, 1936

ENGINEERING

Problem of Power Control Major Question at Conference

Conservation of Natural Resources Stressed as of
Utmost Importance in Any Type of Economic System

THE outstanding question before the Third World Power Conference of some 3,000 delegates from 54 nations who have been meeting in Washington was not concerned with technology or engineering so much as with social and economic philosophy.

Transcending national and linguistic lines, the giant meeting was divided into two friendly factions, those who believe that the energy of the world should be supplied by private industry with a minimum of interference and regulation by government, and those who believe that the people as represented by government should do the job.

It is a high compliment to the organizers of the conference, under the leadership of Morris L. Cooke, Chairman, Executive Committee, American National Committee, that these divergent viewpoints could meet in fruitful discussion and that the conference had the sponsorship on behalf of America of both the various power industries and the federal government.

In many instances the viewpoints of private and public ownership advocates are so diverse that there were two papers from the United States among the prepared reports on various questions that were discussed orally.

Opposing Views

Take the question of national and power resources policies. Floyd Carlisle, of Consolidated Company of New York, assumes *laissez faire* to be a national policy in the United States and deplors tendencies towards modification of it. George Soule, an editor of the *New Republic*, argues that there is not a national policy and that present conditions of production and use require the establishment of a definite policy.

Mr. Carlisle, pointing out that 94 per cent of the electrical business is done by privately owned companies, favors such private ownership and management, with government regulation of "such a character that will not destroy the ability of management to run the business and to make decisions based upon sound economic principles free from political meddling."

Mr. Soule charges that, notwithstanding abundant energy resources and a capacity for high productivity, a large proportion of the population has a low standard of living and there is much unemployment. He says that as a guide to national policy, "a scheme of social accounting must be developed, in order that values and costs that do not appear in the books of private enterprise, but are real and vital to the nation as a whole, may be accorded their due weight."

Because power is so fundamental to modern technological and industrial development, the 3,000 delegates found themselves considering broad questions like "national and regional planning" and "conservation of natural resources" as well as the more technical problems of how to burn coal, utilize oil, build dams and generate and distribute electrical power.

The score or more of national papers

on conservation of national resources were analyzed by David Cushman Coyle, American consulting engineer, as a basis for discussion at the conference.

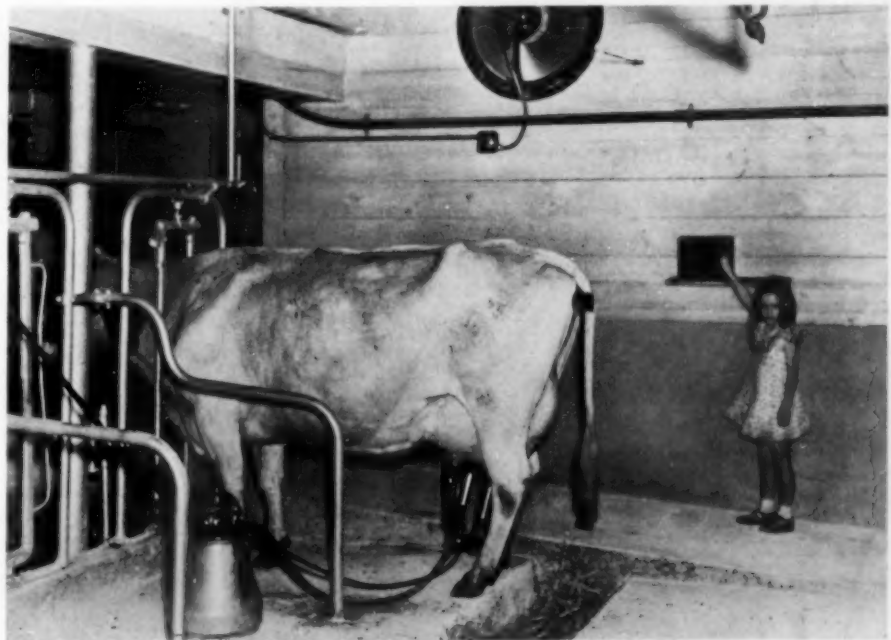
"Our business system may be capitalist or socialist or a combination of the two," Mr. Coyle observed. "Our governments may be democratic or absolutist. But under all forms we must organize our activities to meet the demands of natural law. Toward that end the civilized nations, each in its own way, are now struggling."

The general objective of national economic planning is stated by Mr. Coyle as the highest per capita standard of living at the lowest man hour cost without stoppage of vital fluctuations and with the minimum wastage of national resources.

His principles of resource planning are:

1. To hold soil, water, forest, and grass at par.
2. To economize in the use of the irreplaceable minerals by every possible means.

"Nature lays down the terms; we must obey or suffer," Mr. Coyle said. "We can come to terms with nature in regard to the self-renewing resources by using them only as fast as they are replaced. In regard to the nonreplaceable minerals, we can come to terms only by finding new and abundant sub-



ELECTRICITY MODERNIZES THE FARM

Visitors to the World Power Conference saw what electricity can contribute to the farm when they visited this model farm in Virginia. The little girl is turning on a radio, believed to have a beneficial effect on the cow, while other electric appliances do the milking and ventilating.

stitutes faster than we use up the older materials. Technology races with waste.

"Face to face with the inexorable demands of nature, we suffer from the weakness of human nature. The consent of the people has to be obtained in spite of heavy propaganda by those whose interests stand in the way of the public interest. The laws of a Federal Union of sovereign States are a tangle of inconsistent rights and powers that hampers the action of the Nation. America is now struggling to acquire legal and political powers commensurate with her necessities.

"Modern technology has given to civilized man the power to support a greatly increased population by drawing more rapidly upon the material resources of the earth. For a century man has expanded his activity with little thought of the outcome. But now we realize that a new Malthusian law confronts us. We cannot expand our destruction of forests and soil, coal and petroleum, without

limit. Unless we mend our ways and stop living on our capital we shall not merely press against the limits of subsistence. We are threatened with a crisis in which essential materials will be exhausted and the population will have to be drastically reduced by war or starvation."

Future Power Supplies

Taking a look toward the future, reports before the Third World Power Conference gave estimates of how long petroleum, coal, natural gas and water power resources of the United States will last.

The results are:

Petroleum—There is a possibility of the shortage of domestic petroleum in the United States as early as 1940 and the probability of a considerable shortage by 1945. This does not mean that there is imminent danger of exhaustion of petroleum reserves and there is no justification of hysteria in the figures

reported. But wasteful methods of drilling and using are deplored.

Coal—The question of coal conservation is considered immediate and urgent. Although the coal resources are sufficient for several generations, they are sufficiently limited to make the avoidance of unnecessary waste a matter of social concern. The life of the coal resources at their recent maximum demand is from 1,700 to 2,200 years. With a probable increased demand the reserves are to be considered sufficient for hundreds of years only.

Natural gas—Known domestic reserves are from seventeen to twenty times the annual consumption, although estimates are difficult to make because conditions change rapidly.

Water power—Experts consider that only a comparatively small percentage of the total potential hydroelectric power has been developed. Many other factors enter into use of water for electric power, among them relation of power development to navigation, recreation, wild life, soil conservation, etc.

Petroleum By-Product

The possibility of replacing all the "manufactured gas," usually made from coal, with the by-product gas of petroleum refineries is suggested in one of the reports. The second most important gas resource of America is the nearly 200,000,000,000 cubic feet of gas which has been stripped of all condensable constituents that can be used in motor fuel. It has high heating value, can be made highly uniform and the refineries where it is produced are much more favorably located with respect to potential markets than are natural gas fields. In recent years, natural gas has been piped long distances, in some cases, to displace or compete with manufactured gas and the technologists foresee that the use of the by-product gases of American oil refineries might give a more permanent source of gas for city use over a longer period of years.

In the generation and distribution of electric power, engineers have effected notable economies in fuel consumption and the use of materials. This is a conservation step. But many engineers at the conference feel that this is not enough. Mining of coal, for instance, requires careful engineering to reduce waste. And going beyond production and distribution, some raise the question of the use of the power. Power may be used for purposes that constitute only "a waste of what the engineers have so economically produced."

Science News Letter, September 19, 1936

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● RADIO

September 22, 2:15 p.m., E.S.T.
NEW FACTS ABOUT FEET—Dr. Dudley J. Morton of Columbia University.

September 29, 2:15 p.m., E.S.T.
A DOG'S WORLD—Dr. Carl J. Warden, psychologist, of Columbia University.

In the Science Service series of radio discussions led by Watson Davis, Director, over the Columbia Broadcasting System.

ASTRONOMY

Largest Gaseous Nebula "Found" By New Telescope

See Front Cover

THE photograph of the great celestial cloud known to astronomers as the Eta Carinae nebula taken with the Harvard College Observatory's new 60-inch reflecting telescope at Bloemfontein, South Africa, is for scientific purposes practically a new discovery. This photograph appears on the front cover of this week's SCIENCE NEWS LETTER.

Eta Carinae is the largest gaseous object in the sky that shines with its own rather than reflected light. (See SNL, Sept. 12, for account and pictures of red nebula which reflects light of Antares.) Astronomers have known it for some time, but the powerful new telescope shows so many new details that the new photographs amount to an introduction.

This nebula is famous as the home of a great nova of many years ago, now gone back to its former middle-class astronomical obscurity. In this region also are many exceptionally hot stars.

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From Page 180

German chemists in the main have little to do with this problem. What food we can grow we find a ready market for—as food.

Whereas American chemists are trying to turn food into industrial products we are trying to turn waste products of industry into food. The problem, as you can realize, is almost a complete opposite of yours.

For example, the chemical process which I know best is the method of utilizing waste wood 100 per cent. The chemistry of the problem has been simple, but the application on a mass-production, economical wide scale has been achieved only with difficulty.

We are now able to turn, however, waste wood into digestible carbohydrates of the sugar-type to the extent of from

60 to 66 per cent. On the way through the process we obtain 5 per cent acetic acid which is about the same amount as obtained directly by the distillation of hardwood. And finally we obtain some 30 per cent of lignin which can either be converted into charcoal or pressed into wall board, as you call it, which requires no binding to hold it together.

The problem, you see, is related to the changed commercial trading of the world today over what it was some years ago. The high trade barriers of the world's nations today may have vast implications in international relations. But I am hardly competent to discuss that phase of the subject. What I can say is that many nations are now too poor to buy their raw materials and have turned to the chemist to make them in his laboratory. The accompanying spur and encouragement to chemical research in continental Europe is obvious.

Is the day of the individual inventor passed? No, decidedly not. The growth of the great research laboratories of industry throughout the world may seem to indicate that the lone inventor has no longer an important role. But this

is not the case. The lone inventor still can, and does, conceive basic processes and ideas. The function of the large laboratory is, of course, to think of these ideas if it can but if some new thing comes along, to take it and aid it.

Through the very difficult trying days when it is turning from an "infant" to adult "manhood" and goes out into the world to compete with other inventions, the resources of a large laboratory appear, now, to be quite essential.

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Swarming bees sometimes choose queer homes, such as squirrel dens, church belfries, or empty barrels.

A bee farm in southern Germany raises bees in order to extract their poison, which is used in treating rheumatism.

A library of Oriental documents now being assembled at the University of California is expected to become an outstanding collection in this field.

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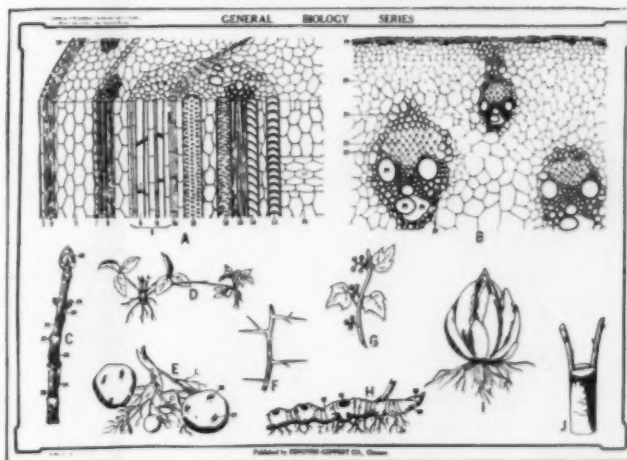


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•First Glances at New Books

Psychology

ELEMENTARY GENERAL PSYCHOLOGY—Samuel W. Fernberger—*Williams & Wilkins*, 445 p., \$3. A book which the author specifically states is not written for the eyes of psychologists, this authoritative text presents a wealth of information in an informal manner that provides good interesting reading for anyone desiring knowledge of this science.

Science News Letter, September 19, 1936

Chemistry

MODERN ALCHEMY—Dorothy Fisk—*Appleton-Century*, 171 p., \$1.75. Since ancient times, men have tried to perform the miracle of converting baser metals into gold. As simply as possible, the author outlines recent research in the world of the electron, proton, neutron, "heavy water" and finally, actual transmutations of one element into another.

Science News Letter, September 19, 1936

Mathematics

INTRODUCTORY COLLEGE MATHEMATICS—F. E. Johnston—*Farrar & Rinehart*, 314 p., \$2.60. An algebra text for college freshmen, by an associate professor of mathematics at George Washington University.

Science News Letter, September 19, 1936

Physics

UNIFIED PHYSICS: MATTER IN MOTION—G. L. Fletcher, Irving Mosbacher and Sidney Lehman—*McGraw-Hill*, 662 p., \$1.80. A well-presented, well-illustrated text by three teachers of physics in the New York high schools.

Science News Letter, September 19, 1936

Bacteriology-Pathology

MICROBIOLOGY AND PATHOLOGY FOR NURSES—Charles F. Carter, *Mosby*, 682 p., 138 illus., 14 color plates, \$3. A comprehensive text for schools of nursing, by the Director of Carter's Clinical Laboratory in Dallas, and lecturer in bacteriology and pathology at the Parkland Hospital School of Nursing.

Science News Letter, September 19, 1936

Aviation

THE WONDER BOOK OF THE AIR—C. B. Allen and Lauren D. Lyman—*Winston*, 339 p., \$2.50. "This *Wonder Book of the Air* brings to every boy the thrilling romance of man's conquest of the air and, with first-hand descriptions of actual flights, carries him over the

sky lines of the world as entrancingly as if he were seated in a modern air liner speeding swiftly toward the far horizon."

Science News Letter, September 19, 1936

Psychology

THE EMERGENCE OF HUMAN CULTURE—Carl J. Warden—*Macmillan*, 189 p., \$2. An interesting successor to the author's "The Evolution of Human Behavior." Dr. Warden is in charge of the Laboratory of Comparative Psychology at Columbia University.

Science News Letter, September 19, 1936

Psychology

CHARACTER AND CITIZENSHIP TRAINING IN THE PUBLIC SCHOOL—Vernon Jones—*University of Chicago Press*, 404 p., \$3. Here are presented the results of an experiment conducted with several hundred children in New Haven, Conn. Even with the most careful planning and persistent work, this sort of training produces but little change in the character of children, the author concludes. Less could be expected of any hit-or-miss incidental instruction. The effectiveness of various character training methods varies with the individual teacher, but the best scheme, Dr. Jones feels, is a combination of experience in concrete situations in which honest or cooperative behavior were involved and a discussion of the principles applying to such situations.

Science News Letter, September 19, 1936

Natural History, Juvenile

DO YOU KNOW ABOUT FISHES?—Janet Smalley—*Morrow*, 45 p., \$1.25. The author has dedicated this delightful picture book to Sonny, who caught a fish. A surprising number of facts about fishes are scattered among the colored picture-pages.

Science News Letter, September 19, 1936

Biology

A LEARNING GUIDE IN BIOLOGY—Elliot R. Downing and Veva M. McAttee—*Lyons and Carnahan*, 314 p., 69c. (Test booklet included with each Guide purchased.)

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Physiology

A TEXT-BOOK OF PHYSIOLOGY FOR MEDICAL STUDENTS AND PHYSICIANS, 13th Edition—William H. Howell—*W. B. Saunders*, 1150 p., \$7. Students and teachers, about to start the academic year, will welcome the appearance of the latest revised edition of this book which because of its general excellence has long held a leading position among textbooks on physiology. The constant growth of physiological science makes it a somewhat herculean task to revise and bring up-to-date a general text on the subject. A glance through the pages of the book shows the task has been accomplished.

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Travel

GERMANY, A HANDBOOK FOR RAILWAY TRAVELLERS AND MOTORISTS—Karl Baedeker—*Scribner's*, 528 p., 108 maps and plans, road map, \$6. Baedeker's handbooks are too well known to need a description. This entirely new book on Germany will be needed by anyone who expects to travel in Germany; it is also extremely useful as a reference book, in libraries.

Science News Letter, September 19, 1936

Photography

THE PHOTO-GUIDES: 1, A Good Picture Every Time—Alex Strasser, 40 p.; **2, Sharp Focus and Accurate Exposure**—W. Kross, 46 p.; **3, 130 Photo-faults**—Wolf H. Döring, 53 p.; **4, Taking Pictures at Night**—W. Kross, 40 p.—*Amer. Photographic Pub. Co.*, 40c each. Simply written booklets for the amateur photographer.

Science News Letter, September 19, 1936

Chemistry

A LABORATORY MANUAL OF GENERAL CHEMISTRY—Herman T. Briscoe, Herschel Hunt and Francis M. Whitacre—*Houghton Mifflin*, 113, 155 p., \$1.75. Three professors of chemistry present experimental subjects and methods that have proved successful in their university classes. A clever arrangement of ring binders on two sides of the book permits it to be opened flat, in three sections.

Science News Letter, September 19, 1936

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